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10/16/2003

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EXAMINER

CHUO, TONY SHENG HSIANG

ART UNIT

PAPER NUMBER

1795

MAIL DATE

DELIVERY MODE

11/17/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/686,480	Applicant(s) NISHIMURA ET AL.	
	Examiner Tony Chuo	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 August 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-8, 11-13, 16-25, 28-33 and 38-46 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-8, 11-13, 16-25, 28-33 and 38-46 is/are rejected.
- 7) ☒ Claim(s) 4 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 June 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Claims 2-8, 11-13, 16-25, 28-33, and 38-46 are currently pending. Claims 1, 9, 10, 14, 15, 26, 27, and 34-37 have been cancelled. New claims 45 and 46 have been added. The previous objection to claim 41 is withdrawn. The previous 112, 1st paragraph rejections of claims 33 and 34 are withdrawn. The amended claims do not overcome the previously stated 102 and 103 rejections. Therefore, upon further consideration, claims 2-8, 11-13, 16-25, 28-33, and 38-46 are rejected under the following 112, 102, and 103 rejections.

Claim Objections

2. Claim 4 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The amended claim 18 already recites a water-retaining layer that adjoins a water permeable layer.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

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4. Claims 8 and 46 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Since the amended claim 18 is supported by the embodiment of figure 2, the limitations of claims 8 and 46 are not supported by the specification because the embodiment of figure 2 does not include a carbonaceous porous filter. The specification does not disclose a structure that includes both a water permeable layer and a carbonaceous porous filter.

5. Claim 19 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The limitation “only a part of a surface of the water permeable layer” is not supported by the specification. According to Figure 2, water retained in the water-retaining layer is supplied to the flow channel through the water permeable layer from the entire surface of the water permeable layer.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 33 and 38-40 are rejected under 35 U.S.C. 102(b) as being anticipated by Kawazu (JP 08-138704).

Regarding claim 33, the Kawazu reference discloses a fuel cell assembly comprising: a humidifier "200" and a plurality of fuel cell units "10", wherein each of the fuel cell units comprises an electrolyte membrane "11", a cathode "12" adjacent to one face of the membrane, an anode "13" adjacent to the other face of the membrane, a gas diffusion layer adjacent to the cathode, a gas diffusion layer adjacent to the anode, a separator "14" having a flow channel for flowing oxidizing gas, which is adjacent to the cathode, and a separator "15" having a flow channel for flowing fuel gas, which is adjacent to the anode, wherein the humidifier comprises a porous membrane (water-retaining layer) "602" for retaining water supplied thereto, wherein the porous membrane "602" communicates with a channel containing water by way of a porous carbon (filter) "610" disposed at a position where the cooling water inlet and the porous membrane communicate with each other, and wherein the humidifier adjoins an end of the plurality of the fuel cell units in such as relation that the porous membrane faces the flow channels thereby to transfer water introduced into the porous membrane to the fuel gas and oxidizing gas flowing in the flow channels (See paragraphs [0031],[0033],[0034],[0036],[0040], and Drawings 1, 3, and 5).

Regarding claim 38, it also discloses a porous membrane that is a hydrophilic polyolefin material (See paragraph [0037]).

Regarding claim 39, it also discloses a porous membrane “602” that takes water thereinto at a peripheral portion thereof, where the porous membrane is in contact with cooling water (See Drawing 5).

Regarding claim 40, it also discloses a fuel cell assembly that has a single humidification unit “200” (See Drawing 1).

8. Claims 33 and 38-40 are rejected under 35 U.S.C. 102(b) as being anticipated by Mizuno (JP 07-135012).

Regarding claim 33, the Mizuno reference discloses a fuel cell assembly comprising: a humidifier “30” and a plurality of fuel cell units “100”, wherein each of the fuel cell units comprises an electrolyte membrane “110”; a cathode “130” adjacent to one face of the membrane; an anode “120” adjacent to the other face of the membrane; a separator “150” having a flow channel for flowing oxidizing gas, which is adjacent to the cathode; and a separator “140” having a flow channel for flowing fuel gas, which is adjacent to the anode, wherein the humidifier comprises a hydrophilic layer (water-retaining layer) “314” for retaining water supplied thereto, wherein the hydrophilic layer “314” communicates with a channel containing water “308” by way of a microporous film (filter) “312” disposed between the cooling water inlet and the hydrophilic layer, and wherein the humidifier adjoins an end of the plurality of the fuel cell units in such a relation that the hydrophilic layer faces the flow channels thereby to transfer water introduced into the hydrophilic layer to the fuel gas and oxidizing gas flowing in the flow channels (See paragraphs [0013],[0015], [0016],[0019] and Drawings 1-3).

Regarding claim 38, it also discloses a hydrophilic layer “314” that is made of polypropylene (See paragraph [0020])

Regarding claim 39, it also discloses a hydrophilic layer “314” that takes water thereinto at a peripheral portion thereof, where the hydrophilic layer is in contact with cooling water (See Drawing 3).

Regarding claim 40, it also discloses a fuel cell assembly that has a single humidification unit “200” (See Drawing 1).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

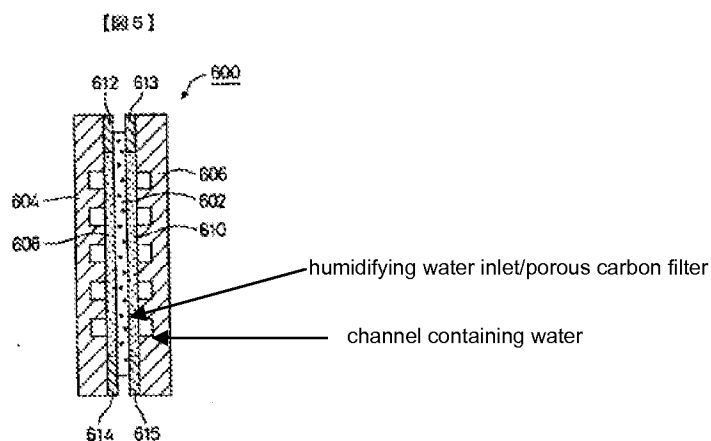
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 2, 4-6, 11-13, 16-22, 24, 25, 28, 29, 31, 32, 45, and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawazu (JP 08-138704) in view of Yi et al (US 2001/0004501).

Regarding claims 4, 13, 16, 17, 19, 22, 24, 45, and 46, the Kawazu reference discloses a fuel cell assembly comprising: and a stack of fuel cell units “10”, wherein each of the fuel cell units comprises an electrolyte membrane “11”, a cathode “12” adjacent to one face of the membrane, an anode “13” adjacent to the other face of the membrane, a gas diffusion layer adjacent to the cathode, a gas diffusion layer adjacent to the anode, a separator “14” having a flow channel for flowing oxidizing gas, which is

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adjacent to the cathode, and a separator "15" having a flow channel for flowing fuel gas, which is adjacent to the anode and a humidifier "200" connected to one end of the stack, wherein the humidifier comprises a porous membrane (water-retaining layer) "602" for retaining water supplied thereto, wherein the porous membrane is in contact with a porous carbon (water permeable layer) "608" that adjoins the gas flow channels, wherein the porous membrane being in contact with a channel containing water, wherein the porous membrane faces the flow channels thereby to transfer water introduced into the porous membrane to the fuel gas, oxidizing gas, and membrane electrolyte, wherein the porous membrane has one surface to supply water to the flow channels and a surface opposite to the water supplying surface that supplies water to the porous membrane, wherein water is supplied from the outer edge of the water-retaining layer, and wherein the water-retaining layer is communicated with a channel containing water by means only of a porous carbon "610" (porous humidifying water inlet means) (See paragraphs [0031],[0033],[0034], [0036],[0040], and Drawings 1, 3, and 5).



Regarding claims 5 and 6, it also discloses a porous membrane "602" that has an average pore size of 0.05 μm , a thickness of 12-100 μm , and a porosity of more than 50% (See paragraphs [0037],[0063]).

Regarding claim 11, it also discloses a hydrogen gas storage tub (not shown) that is connected to the fuel cell assembly with a hydrogen gas passageway "540" through which the hydrogen flows (See paragraph [0044]).

Regarding claim 2, 18, and 21, it also discloses a porous membrane that is made of a hydrophilic polyolefin material (See paragraph [0037]). It also discloses a porous carbon "610" that controls the flow rate of water to the porous membrane "602" (See Drawing 5).

Regarding claim 20, it also discloses two water retaining layers "610", one for the hydrogen gas humidifier "110" and one for the oxygen gas humidifier "120" (See Drawings 1 and 5).

Regarding claim 25, it also discloses a porous carbon "608" located adjacent to the end of the plurality of fuel cell units and between the plurality of fuel cell units and the porous membrane "602" (See Drawings 1 and 5).

Regarding claims 28, 29, and 31, it also discloses a porous membrane "602" that is in contact with water in a cooling water channel and takes water thereinto at a peripheral portion thereof (See Drawing 5).

Regarding claim 32, it also discloses a fuel cell assembly that has a single humidification unit "200" (See Drawing 1).

However, Kawazu does not expressly teach a water-retaining layer that has a mean micro-pore diameter of 10 to 300 μm and a thickness of 50 to 300 μm , whereby water is retained by capillary force by the water-retaining layer when the stack of unit fuel cells is not working and is taken by gas fed to the anode and gas fed to the cathode against the capillary force when the stack of unit fuel cells is working; a water-retaining layer that adjoins the anode or cathode; or a water permeable layer that adjoins the anode or cathode. The Yi reference discloses hydrophilic substrate layers "100" & "102" that functions as water-retaining layers that humidify the anode gas and cathode gas that are comprised of a porous carbon-carbon fibrous composite having a thickness of about 175 microns and a pore size of about 27 microns to 37 microns (See paragraph [0066]). It also discloses water-retaining layers "100" & "102" that adjoin the anode "72" and cathode "74" (See Figure 5).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Kawazu humidifier to replace the porous membrane "602" with a water-retaining layer that has a mean micro-pore diameter of 10 to 300 μm and a thickness of 50 to 300 μm ; a water-retaining layer that adjoins the anode or cathode; and a water permeable layer that adjoins the anode or cathode in order to maintain proper water balance in the anode and cathode, thereby prolonging the fuel cell's life, as well as improving its electrical efficiency and to minimize the thickness of the fuel cell stack (See paragraph [0010]).

Examiner's note: It is inherent that water is retained by capillary force by the Yi hydrophilic substrate layer when the stack of unit fuel cells is not working and is taken

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by gas fed to the anode and gas fed to the cathode against the capillary force when the stack of unit fuel cells is working.

11. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawazu (JP 08-138704) in view of Yi et al (US 2001/0004501) as applied to claim 18 above.

However, Kawazu as modified by Yi et al does not expressly teach the thickness of a humidifying water inlet of the humidifier that is $\frac{1}{2}$ to $\frac{3}{4}$ the thickness of the porous member.

However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Kawazu/Yi fuel cell to include a humidifying water inlet having a thickness of $\frac{1}{2}$ to $\frac{3}{4}$ the thickness of the porous member because changes in proportion were held to have been obvious (See Gardner v. TEC Systems, Inc. 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984)).

12. Claims 7, 23, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawazu (JP 08-138704) in view of Yi et al (US 2001/0004501) as applied to claims 4, 18, 22, and 24 above, and further in view of Kanazawa (US 2003/0087982).

However, Kawazu as modified by Yi et al does not expressly teach a water permeable membrane that is one or more membranes that are treated to be hydrophilic and are selected from the group consisting of polytetrafluoroethylene, polystyrene, and copolymers of styrene and butadiene; a water-retaining layer that is a polypropylene non-woven cloth that is made hydrophilic; or a water retaining layer that is made of a hydrophilic polymer material. The Kanazawa reference discloses polymeric materials which are treated to be hydrophilic that have improved properties of water absorption

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such as polypropylene non-woven fabric and polystyrene (See Abstract, paragraph [0033],[0181]).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the disclosure of Kanazawa indicates that hydrophilic polymer material such as polypropylene non-woven fabric and polystyrene are suitable materials for use as water retention materials and water permeable materials. The selection of a known material based on its suitability for its intended use has generally been held to be *prima facie* obvious (MPEP §2144.07). As such, it would be obvious to use polypropylene non-woven fabric and polystyrene that have been treated to be hydrophilic.

13. Claims 41-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawazu (JP 08-138704) in view of Yi et al (US 2001/0004501) as applied to claim 18, 22, and 24 above, and further in view of Kawazu (JP 08-138705).

However, Kawazu as modified by Yi et al does not expressly teach a porous member that has a hydrogen-oxidizing catalyst dispersed therein. The Kawazu '705 reference discloses a hydrogen oxidizing catalyst "22" that is dispersed on the porous film "21" of a humidifier for a fuel cell (See Abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Kawazu/Yi fuel cell to include a porous member that has a hydrogen-oxidizing catalyst dispersed therein in order to prevent a drop in the power generating capability of the fuel cell by preventing a drop in

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humidifying function caused by hydrogen gas penetrating from a gas flow path side to a water flow path side through a porous film.

14. Claim 44 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawazu (JP 08-138704) in view of Kawazu (JP 08-138705). The Kawazu '704 reference is applied to claim 33 above.

However, Kawazu does not expressly teach a porous member that has a hydrogen-oxidizing catalyst dispersed therein. The Kawazu '705 reference discloses a hydrogen oxidizing catalyst "22" that is dispersed on the porous film "21" of a humidifier for a fuel cell (See Abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Kawazu fuel cell to include a porous member that has a hydrogen-oxidizing catalyst dispersed therein in order to prevent a drop in the power generating capability of the fuel cell by preventing a drop in humidifying function caused by hydrogen gas penetrating from a gas flow path side to a water flow path side through a porous film.

Response to Arguments

15. Applicant's arguments filed 8/4/08 have been fully considered but they are not persuasive.

The applicant argues that claim 18 recites a water-retaining layer that is disposed to adjoin a water permeable layer without positive recitation of the water permeable

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layer. The examiner disagrees with this interpretation of claim 18 because claim 18 clearly does positively recite a water permeable layer.

Regarding the 112, 1st paragraph rejection of claim 8, the applicant argues that the applicants' disclosure as a whole describes such a carbonaceous porous filter, satisfying the description requirement of the first paragraph of 35 USC 112 in connection therewith. Since claim 18 recites a water permeable layer and claim 8 depends on claim 18, the examiner maintains the contention that there is no support in the specification of a structure that includes both a water permeable layer and a porous carbon filter. The specification discloses that a water permeable layer is omitted when a porous carbon filter is used.

The applicant further argues that the position and function of the porous carbon in Kawazu '704 are different from those of the filter according to the present invention. According to the claims of the present invention, the porous carbon filter is located between the water-retaining layer and a channel containing water. Kawazu '704 also discloses a porous carbon that is located between the water-retaining layer and a channel containing water so therefore the position of the porous carbon is the same as the filter according to the present invention. Although the function of the porous carbon in Kawazu '704 appears to be different than the function of the filter according to the present invention, the Kawazu porous carbon is at least capable of performing the same function as the filter of the present invention.

The applicant further argues that when freezing of cooling water takes place in the structure of Kawazu '704, the filter may be broken and the humidifier will not work.

This argument appear to be based on a hypothetical situation of what may happen during these conditions and not based on any structural differences between Kawazu and the present invention.

Regarding the rejection based on the Mizuno reference, the examiner agrees that the Mizuno does not read on the amended claims so therefore that rejection is withdrawn.

The applicant further argues that the neither Kawazu '704 or Mizuno would have disclosed or would have suggested the subject matter of, e.g. claim 33, including the filter and location thereof, achieving the function thereof as in the present invention. The examiner maintains the contention that the Kawazu porous carbon is in the same location and is capable of performing the same function as the filter of the present invention because the specific properties of the porous filter are not recited in the claims.

The applicant further argues that with the structure as in Kawazu '704, there is such a problem that damage or breakage of the porous sheet can take place by mechanical shock, or contamination of gas by corrosion can occur when foamed nickel is used. As stated above, this argument also appears to be based upon a hypothetical condition and not based upon any structural differences between the structure in Kawazu and the structure recited in the claims of the present invention.

The applicant further argues that even assuming that the teachings of the references as applied by the Examiner would have been properly combinable, such combined teachings that neither disclosed or would have suggested the presently

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claimed structure, including, inter alia, wherein water is supplied from only a part of surface opposite to the water supplying surface and/or from the outer edge of the water-retaining layer (see claims 17 and 19); and/or wherein the water-retaining layer is communicated with a channel containing water by means of only a porous humidifying water inlet means, as in claims 18, 22 and 24. The examiner maintains the contention that Kawazu still reads on the claims because Kawazu discloses that water is supplied from the outer edge of the water retaining layer and also the water-retaining layer is communicated with a channel containing water by means of only a porous carbon that is construed as a porous humidifying water inlet means.

The applicant further argues that only the humidifying water intake port 202 or filter 501 of the water retaining layer contacts the cooling water channels 204 according to the present invention and that the structure would have neither been taught nor suggested by any of Kawazu '704, Mizuno and Yi. Once again, the examiner contends that the Kawazu porous carbon is capable of performing the same function as the humidifying water intake port 202 or filter 501 and also that only the porous carbon contacts the cooling water channels.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

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mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tony Chuo whose telephone number is (571)272-0717. The examiner can normally be reached on M-F, 9:00AM to 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TC

/Jonathan Crepeau/
Primary Examiner, Art Unit 1795